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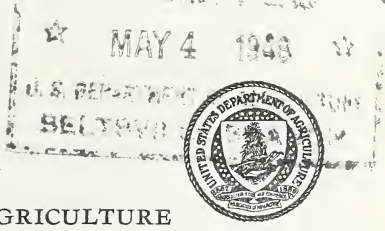
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Brucellosis of Swine

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GENERAL NATURE OF BRUCELLOSIS

Brucellosis of swine, formerly called contagious abortion of swine, is a chronic infectious disease, caused by a specific germ and characterized at times by abortion, the birth of stillborn or weak pigs, temporary or permanent sterility, and less commonly by joint swellings and posterior paralysis. In boars, the disease may be evidenced by the swelling of one or both testicles and decreased breeding ability. These conditions in individual animals are variable, depending on the susceptibility of the herd and the length of time the infection has been present.

CAUSE OF THE DISEASE

Brucellosis in swine is caused by a specific germ, *Brucella suis*. This micro-organism is closely related to two others, *Brucella abortus*, the cause of brucellosis of cattle, or Bang's disease, and *Brucella melitensis*, of brucellosis in goats. These three micro-organisms comprise the genus *Brucella*. Although the hosts mentioned for each of these

¹ The data contained in this publication constitute the findings of Federal and State investigators who have cooperated in special studies on this subject since 1941. Cooperating with the Animal Disease Station of the Pathological division, Bureau of Animal Industry, United States Department of Agriculture are: (1) The California Agricultural Experiment Station, (2) the Minnesota Agricultural Experiment Station, and (3) The Indiana Agricultural Experiment Station.

species of *Brucella* are the natural habitats of the respective germs, there is some cross-infection in other animal species, as will later be described.

METHODS OF EXPOSURE

Suckling pigs receive exposure through the milk of the infected dam and infected premises. After weaning, infection may be contracted through contact with the older infected animals in the herd or contaminated environment. Sows may contract the disease through feed or water contaminated with uterine discharges, urine, or droppings of infected animals; but probably the chief source of infection in the sow is mating with an infected boar. The *Brucella* germs that gain entrance to the reproductive tract of the sow at the time of mating become established in the uterus, and spread to other parts of the body. Abortion or birth of stillborn or weak pigs is usually a result of such exposure. Boars may be infected through the mouth by means of feed or water contaminated with the excreta of infected animals, and through the copulatory organs at the time of service with a sow with uterine infection. Boars may also become infected through the mouth when "teasing" sows that have a discharge from the external genitals.

Brucella suis may also be carried to the premises on contaminated feed bags, by streams of water flowing through or drainage from infected premises, and various other means of similar indirect exposure. Owners frequenting public sales or infected premises may bring the germs back to their own premises on their shoes or clothing. Although no reports of outbreaks of brucellosis in swine have been reported from the feeding of raw garbage, it would seem that if raw pork trimmings were present in uncooked garbage they would be a hazard in this connection. Offal from local abattoirs fed to swine would be a definite source of exposure.

SUSCEPTIBILITY OF ANIMALS

Swine of all ages may be naturally infected with *Brucella suis*. This is in contrast with brucellosis of cattle which is mainly a disease of sexually mature cattle.

Other species of animals are relatively resistant to *Br. suis* but severe exposure may cause infection in individual animals. A few cases have been reported of *Br. suis* localizing in the udder of milking cows that have been in close contact on farms with infected swine, although in experiments especially designed to gather information on this possibility, the results were negative.

Fistula of the withers and poll evil in horses have been shown frequently to harbor the cattle type of *Brucella*, *Br. abortus*, but strangely enough the swine species of *Brucella* has only rarely been recovered from such sites. This may be due to the fact that horses are less frequently in contact with swine than with cattle.

Br. suis has been recovered on several occasions from sick dogs on farms where swine infection is present. Eating an aborted fetus would provide ample exposure for such infection. Chickens and cats have also been shown in a few instances to harbor this germ.

Human beings may be readily infected with *Br. suis*. This will be discussed more fully under the heading "Public Health Aspects."

Swine are very resistant naturally to the bovine species of *Brucella*. No recovery of *Br. abortus* from swine has been reported. *Br. melitensis*, of which the goat is the natural habitat, has been reported to have been recovered from swine. There is comparatively little brucellosis in goats in the United States, with the exception of those States bordering on Mexico, and the goat species of *Brucella* would not appear, therefore, to present a hazard to swine unless the disease in goats should become more widespread.

LOCALIZATION OF ORGANISM

In young pigs the blood stream is usually the first site in which the germ may be demonstrated. In probably the large majority of instances no further localization occurs in pigs of this age. The average blood stream infection in young pigs lasts from 1 to 6 weeks but the infection in the blood stream has persisted in some instances for as long as 8 months. In a small percentage of pigs the germ may localize in lymph nodes and other internal organs and on very rare occasions in bones and joints, which is sufficient to perpetuate the disease in the herd.

In sows of breeding age and older, the germ after gaining entrance to the body may be found for various periods in the blood stream; it may localize in lymph nodes, especially those of the head, in the spleen, liver, kidney, urinary bladder, uterus, mammary glands, or in the spinal column, and infrequently in the joints of the feet.

In boars the organism tends to lodge most frequently in the testicles, seminal vesicles, and other accessory sex glands; it may also be present in the blood stream, various lymph nodes, liver, spleen, kidneys, and urinary bladder. Bone involvement, especially of the spine, is not uncommon.

PERSISTENCE OF INFECTION

Brucellosis in swine has frequently been termed a self-limiting disease, which means that infection after running an acute course in a herd tends to be gradually eliminated from the herd through recovery from the disease and sale of animals for slaughter. This sequence may happen in small herds owing to the rapid turn-over of animals, but in larger herds the infection is apt to be continued in some of the sows and boars that are retained for breeding purposes, thus perpetuating itself in each new crop of pigs. In suckling pigs and shoats, a transient blood stream infection is usually the only evidence of the disease. Even though the infection disappears from the blood stream, these animals, on reaching breeding age, may become reinfected and the subsequent course of the disease will be the same as in adults not previously exposed.

In sows of breeding age or older the organism may persist in the blood stream for various periods of time, the longest period on record being 34 months. Infection in lymph nodes may be transient or may persist indefinitely. During pregnancy the uterus often becomes infected if there is infection elsewhere in the body. The infection may persist indefinitely in the uterus as a form of metritis, or inflammation of the lining membranes, thus preventing conception, and may be

termed sterility. Probably in the majority of instances the infection in the uterus will be resolved within 2 to 4 weeks following abortion or parturition; in two experimental animals the organism was recovered from uterine discharge for 31 months after exposure. Infections in the bones and joints are usually chronic and may persist for the life of the animal. Infection in the udder disappears in some animals before the succeeding pregnancy, whereas in others it may persist for the life of the animal.

In the boar an infection, when once established in the testicles or seminal vesicles, tends to persist indefinitely. Bone and joint involvements are also chronic.

ELIMINATION OF *BRUCELLA SUIIS* FROM THE BODY

Brucella suis may be present in the feces, if *Brucella* is present in the intestinal tract, either through localized infection in the intestines or drainage from the infected liver through the gall duct.

Likewise urine may excrete the germs if there is kidney infection or localization in the urinary bladder. Infection of the uterus is often accompanied by a scanty, thin discharge which empties externally through the vagina. As the urinary duct (urethra) empties into the vagina, the urine contains the uterine discharge.

In sows the germ is expelled in the milk if the udder is infected. In boars with infection in the genital tract the germ is expelled in the semen. The semen may thus not only affect the sow bred, but drippings from the penis and sheath after ejaculation and semen escaping from the vagina after mating may contaminate soil, feed, or water.

SYMPTOMS AND LESIONS

The most common symptom of brucellosis in swine is abortion or the birth of stillborn or weak pigs. This usually occurs after an infected sire has been added to the herd. In some instances, in non-infected herds where the susceptibility to infection is high, all sows bred to a recently purchased infected boar have aborted. Abortion may occur so early in pregnancy that it may be overlooked and the sow thought not to have conceived. When the natural resistance is relatively high, pigs may be carried full term but weak and only a small number will survive. Sows that have aborted once will usually farrow normal litters thereafter with no uterine infection. However, a few sows on succeeding pregnancies will bear apparently normal litters but the uterus may excrete a discharge containing large numbers of *Brucella suis*. Thus, sows successfully bred following abortion usually bear normal litters even though infection persists.

Sterility is often an indication of infection with *Br. suis*. A persistent but scanty discharge from the uterus may follow abortion as a result of metritis, or inflammation of the mucous membranes of the uterus. Sows so affected cannot be bred successfully and thus are either temporarily or permanently sterile, depending on the persistence of the uterine infection.

Thin, watery secretions from the uterus, discharged through the external genitalia, are a possible indication of brucellosis.

The testicles of boars, when infected, become swollen. One or both testicles may be involved. Usually such infections are chronic. Adhesions in the scrotum have been observed in young pigs at the time of castration, which may be an indication of infection with *Br. suis*.

Bone involvement in chronic swine brucellosis is not uncommon. In one survey of 62 experimentally infected hogs, 13, or 20.9 percent, showed lesions in the spine (spondylitis) from which *Br. suis* was recovered. Such lesions, when not extensive, may not be suspected in the live animal but are readily discernible on section in the slaughtered animal. When the spondylitis is extensive, a staggering gait or posterior paralysis is manifested. On rare occasions, joints, especially in the legs, become involved; such conditions are also found in other diseases such as swine erysipelas and tuberculosis and thus are not a sure indication of brucellosis.

Although lesions consisting of abscesses in the liver, spleen, and tendon sheaths and under the skin have been reported, such lesions are very rare. For instance, in liver infection, the lesions are usually so small that they are barely discernible to the naked eye.

Symptoms and lesions are extremely variable in individual animals. In fact the disease may persist in some herds in such a mild form that its presence is unsuspected.

DIAGNOSIS

The blood serum agglutination test conducted with a standardized antigen has proved to be very effective in diagnosing brucellosis in cattle (Bang's disease). In swine brucellosis, however, it is not of comparable value. Swine infected with *Brucella suis* do not produce agglutinins (a reacting substance in the blood serum) in uniform amounts. In cattle a blood titer of 1:100 is indicative of infection, 1:50 suspicious, and 1:25 negative; in an infected herd of swine, however, although many infected animals show blood titers of 1:100 or over, other animals showing titers of 1:50, 1:25, and a small percentage entirely negative, have been shown to harbor *Br. suis* in their bodies. Moreover, in noninfected herds of swine, it is not uncommon to find a small percentage of hogs with titers of 1:25 and even 1:50. The cause of these nonspecific reactions is not known. It is apparent, therefore, that the agglutination test in swine brucellosis cannot be depended upon in diagnosing infection in individual animals.

The test has a practical use, however, in determining herd infection. Where brucellosis is suspected in a swine herd, the blood test should be made on all animals. If titers of 1:100 or over are found in any of the animals, the herd should be considered infected, and all animals regardless of blood titer should be considered as possible carriers of infection.

A herd of swine may be considered free from infection when, on two tests made 30 to 60 days apart, no animal shows a titer of 1:100 or over; there is no previous evidence of infection such as abortions, weak litters, or sterility; and no additions to the herd have been made within 3 months.

An intradermic or skin test has been used experimentally in the diagnosis of swine brucellosis. The skin test material (antigen) used

is a product prepared from *Brucella* organisms and is known as "brucellergen" (Huddleson). This agent, on injection into the skin, causes a swelling at the site of injection in infected animals. The results with this test were much in accord with those obtained in the blood agglutination test, except that a few animals reacted to one test but not to the other. The consensus of those using both tests comparatively was that the skin test was slightly more sensitive but that more nonspecific reactions were obtained with it than with the blood test.

Neither the blood test nor the skin test alone can, in most instances, be used effectively in the eradication of swine brucellosis in a herd. Experimental results have been borne out in actual field trials using the method of test and slaughter of reactors to eradicate the disease. In one trial, after 4 years of slaughtering of reactors, infected animals were still found in the herd. The diagnostic test, however, may be used to advantage in conjunction with other methods in the control of this disease as will be discussed in the section on control.

TREATMENT

No drug, medicine, or biologic agent has been found effective in preventing or curing brucellosis in swine. The apparently beneficial results following treatment may be attributed to the tendency of the disease to be self-limiting, and not to medication used.

VACCINATION

The effectiveness of strain 19 *Brucella abortus* vaccine in increasing the resistance of calves to bovine brucellosis suggested that this vaccine might likewise be an effective agent in controlling brucellosis in swine. Carefully controlled experiments by two of the groups co-operating in these studies proved conclusively that no serviceable resistance in swine was induced by strain 19 vaccine. Studies of a vaccine prepared from a strain of *Br. suis* of low virulence (King strain), on the other hand, showed that the resistance to artificial exposure could be markedly increased for a period of a few months by this vaccine but that the increased resistance was completely lost within 2 years.

There is no proof that this King strain of *Br. suis* will continue to show reduced virulence, that is, that it will not return to full virulence in some susceptible swine and in others actually set up infection rather than prevent it. Furthermore it is known that man is very susceptible to *Br. suis*. The use of this type of vaccine, therefore, is hazardous not only to swine but especially to persons preparing or injecting it. Mention is made of the King strain of vaccine merely to show that, comparatively, strain 19 vaccine has no value in preventing infection in swine. Its use is not only an added expense to owners of infected herds but creates a false sense of security from a control standpoint.

PREVENTION

As previous statements indicate, the owner of a noninfected herd must exercise utmost care to prevent the introduction of swine brucel-

losis. This infection is undoubtedly more prevalent than is appreciated. The lack of a more efficient diagnostic agent makes it very difficult to estimate the incidence of infection. This varies in different areas, but with the heavy traffic in purebred swine, the increasing display and purchase of animals at public sales and fairs, and the necessity of introducing herd sires at frequent intervals, no areas can now be recognized as free from infection.

Probably the most important preventive measure is to be as sure as possible that the herd from which replacements are made is free from infection. Although the blood test is not to be relied on in all cases, each replacement should be tested and no animal showing a reaction in any degree should be accepted. Replacements should be kept apart from other swine for at least 3 months, and then be retested. These measures obviously would not allow replacements to be made from public sales unless health requirements were established. Buying animals from such sources is often a case of being "penny wise and pound foolish."

The assembly of a herd from many different sources is dangerous, as the possibility of buying at least one animal from an infected herd increases with the number of sources involved. It is safer to start with fewer animals from one source, if possible, and build the herd up to the desired proportions with home-bred additions.

To prevent inbreeding, it is necessary to replace a herd sire with one from another line. It is a common practice to buy a new herd sire just before breeding time and turn him loose in the herd. This is a most dangerous practice. The prudent owner will anticipate his needs several months in advance in order to have at least two blood tests made on the boar. Furthermore, he should be reasonably sure that the herd from which the boar was obtained is not affected with swine brucellosis.

Some owners allow the service of their boar with a neighbor's sows. Such practice may result in the boar's becoming infected, if any of the sows have uterine infection, and spreading the infection to the owner's herd.

The showing of swine at fairs and livestock shows, even where most careful precautions are made to exclude infected animals, provides a possibility of acquiring the infection. Such show animals, on their return, should be kept apart from the main herd for a few months and blood-tested.

The owner of an infected herd or a herd suspected of being infected has a moral obligation to dispose of infected animals for immediate slaughter only. Unfortunately such animals sometimes are offered for sale at local or more remote sales places, thus not only exposing other swine at the sale but definitely carrying the infection to the premises of the purchaser. To throw a deadly poison to a neighbor's stock would be more charitable than to sell him an animal known to be infected with brucellosis. The unwritten law of "*caveat emptor*," or "Let the buyer beware," obtains in such cases, however.

In addition to the foregoing preventive measures, care should be taken to prevent the germ from getting on noninfected premises in an indirect manner. Infection on neighboring premises presents a hazard. A dog may carry back an aborted fetus; slow-moving streams

from or through infected premises may carry the germ; an owner may be curious to see what the symptoms or lesions look like in a neighbor's infected herd and carry back the infecting germ to his own premises.

Attention to the foregoing precautions will go far in preventing infection.

CONTROL

In the section on prevention it has been shown that test-and-slaughter has not usually been effective in eradicating brucellosis in an infected herd of swine. It has also been shown in the chapter on vaccination that it has not been possible to build up a disease-free herd by vaccination with strain 19 *Brucella abortus* vaccine.

With our present knowledge of the disease there are only two methods which offer a solution to this problem:

Plan I: Dispose of the entire herd, clean and disinfect hog barns and premises, and replace herd with swine from herds free from infection.

Plan II: Separate weanlings negative to the blood test from the infected herd and maintain them separately; dispose of the infected herd when marketable.

Plan I is preferable in small herds and in commercial herds. This method is quick and effective, provided safe replacements are procurable. There will be some monetary loss on account of the lapse of a few months between the removal of the infected animals and their replacement with clean animals and because some of the grain, available for feeding, may have to be sold.

Plan II is the method of choice in purebred herds or in herds where breeding for improved blood lines is practiced, especially in large herds.

When this plan is followed, pigs should be weaned at 8 weeks, rather than at 9 to 12 weeks as is sometimes practiced, for the reason that permanent infection is more apt to become established when weaning is deferred beyond 8 weeks of age. The weanlings should be blood tested immediately and those negative in all dilutions should be placed in clean surroundings as remote as practicable from the infected herd. Naturally, the site selected for the new herd should not receive drainage from the infected herds. In caring for the infected swine it is advisable to wear rubbers or boots which should be thoroughly washed and disinfected before leaving infected premises, and hands should be thoroughly washed with soap. Separate utensils and equipment should be used in each herd. Preferably, the same person should not care for both herds, but where this is necessary the infected herd should be cared for last. The object of these precautions is to prevent the introduction of *Brucella* germs into the negative herd.

The new negative group, separated at weaning time, should be blood tested several times up to breeding age, and especially at the latter time. Any pig showing any reaction to the test should be removed immediately.

The procedure to be followed with the infected group depends on whether the "one-litter system" or the "two-litter system" is practiced in the herd; that is, whether only one litter per year or both spring and fall litters are raised.

With the one-litter system, the older herd should be considered infected in its entirety and should be disposed of by slaughter when in a marketable condition—and the sooner the better. Under no condition should any of these hogs be sold to owners of noninfected herds, even though negative to the blood test, as it is quite possible that they might be harboring the infective germ. When the infected unit has been disposed of, the pens, feeding troughs, yards, and utensils should be carefully cleaned and disinfected. Wallows should be treated with quick lime and filled with earth from a clean source. These premises should be left unused until the clean herd has been established, allowing time and sunlight to destroy any germs not contacted by disinfection. The one-litter system provides a greater margin of safety in the establishment of a clean herd, but does interrupt herd economics for a part of 1 year.

With the two-litter system, the same procedures are followed, except that breeding sows and boars are retained until the second litters are weaned. The second-litter pigs should be treated in the same manner as the first-litter pigs but should preferably be kept apart from them until bred. The two-litter system provides more opportunity for possible spread of the infection from the old infected unit to the separated units but has the advantage of not interrupting the economics of hog raising on the farm.

Under either of these systems of control, when the infected unit has been disposed of and the new herd established, the latter should not be considered clean until periodic tests during the ensuing year show that no animals have a positive blood titer. When any animal shows a positive reaction it should be removed immediately and a re-test of the entire herd made within 4 to 6 weeks. Subsequent action depends on the results of the retest.

When a clean herd has been established, great care should be taken not to reintroduce the infection by careless purchase of herd sires, as previously outlined.

GENERAL CONSIDERATIONS

A herd of swine infected with brucellosis obviously is not so profitable as a herd free from infection. When the disease has been chronic for a number of years and the number of abortions has lessened, many owners regard the seeming improvement as a reasonable investment. Actually, however, an infected herd does not produce to the full capacity of a herd free from this disease. One instance which clearly shows this difference is cited.

In an infected herd containing 75 sows, 40 farrowed, and the average number of pigs born based on the number of sows bred was 4.4. Control procedures were begun, based on separating pigs at weaning as a nucleus for a clean herd. The first year this clean herd consisted of 37 sows, and 33 sows produced 297 pigs or an average of 8 pigs each based on the number of sows bred. Deducting for the law of increasing proportions, each sow in the free herd produced 3 more pigs per sow than in the infected herd.

In another infected herd of 40 sows, 22 were sterile. Such figures are not unusual. Many owners have asserted, after disposing of their

infected herd and replacing it with normal swine, that they were money ahead in a year's time.

Another point worthy of consideration, especially when replacements are purchased, is to start with a smaller number of hogs than the number disposed of.

The dealer in purebred animals has a moral obligation to clean up brucellosis. His stock is the main source of supply of herd sires, and an infected boar is the principal means by which infection is introduced into a herd. He will have a better chance to profit financially if he can certify that his swine are free from infection. Owners of noninfected herds of swine should purchase boars only from herds that can be certified as free from this disease. The difference in cost is cheap insurance against the possibility of buying animals that are likely to bring the infection into a herd.

Another point that directly concerns the owner of an infected herd is the possibility of contracting the disease himself. The germ, *Brucella suis*, causing brucellosis in swine, is very infectious for man, causing a serious and prolonged disease as discussed more fully under "Public Health Aspects." It is an important reason for attempting to eradicate brucellosis in his swine.

Before an owner attempts Plan II method of control, he should consult his veterinarian and develop procedures applicable to his herd. The veterinarian is trained in disease control and in blood-testing procedures. Eradication, of course, cannot be purchased. The owner of an infected herd must apply most carefully all control measures and sanitary practices advised by the veterinarian and become familiar with the requirements in order to obtain the desired results. This disease can be eradicated by the methods outlined.

PUBLIC HEALTH ASPECTS

All three species of *Brucella* are infectious for man. The bovine type, or *Br. abortus*, has the greatest opportunity to infect man as it is given off in the milk of cows with udder infection and a relatively large part of cow's milk is still consumed raw. Fortunately, the bovine type of *Brucella* appears to be less invasive for man than the types found in hogs and goats, *Br. suis* and *melitensis*, respectively; however, evidence is conclusive that the germ in cow's milk is capable of causing infection in susceptible persons. A large proportion of human cases results from immediate contact with infected animals at time of abortion, parturition, or slaughter.

On the few occasions that cows have contracted brucellosis from intimate contact with infected swine, the swine type germs present in cow's milk have caused epidemics of brucellosis among the consumers of the milk. The goat type of *Brucella*, although equally as infectious for man as *Br. suis*, offers the least opportunity for exposure for the reason that the goat disease is prevalent, with few exceptions, only in the southwestern States. It appears from recent reports that the disease in goats may be spread naturally to bovine animals; thus, if the disease in goats should become more widespread, *Br. melitensis* might become a menace to human health equal to or greater than *Br. suis* or *Br. abortus*.

Br. suis offers its greatest hazard to persons on infected farms and in slaughter houses. The owner or farm laborer taking care of infected swine may get the germ on his hands, thence to his mouth, and thus contract brucellosis. At farrowing time, especially when some sows have to be assisted manually to give birth to their young, the possibility of contracting the disease is presented as the membranes enveloping the pigs and the fluid present within the membranes may be contaminated with large numbers of the germs. Cracks in or scratches on the skin of the hands may allow the germs to gain entrance to the body. Housewives on farms may become exposed at slaughtering time in the process of making sausage from infected portions of the carcass such as the liver. Such sausage, unless thoroughly cooked, provides exposure to any person eating it. Butchers and cutters in swine-killing establishments often become infected with brucellosis through contact with contaminated blood and infected portions of carcasses.

The question is often asked whether or not housewives may contract brucellosis in handling raw pork products prior to cooking. It has been mentioned previously that *Br. suis* is frequently present in the blood stream of swine for variable periods. While it is present in the blood the germ would thus be present in all sections of the body. However, the number of the germs in the blood stream is usually very small, and if the slaughtered hog is thoroughly bled out there would be extremely few *Brucella* germs remaining in the carcass unless localized in some section such as lymph glands, liver, bone lesions, or genital organs. *Brucella* germs do not localize in muscle tissues.

It is very doubtful, therefore, if properly killed pork could be considered other than a minor health hazard under these conditions. The absence of proved instances of such infection, though thousands of housewives handle fresh pork daily, would bear out this assumption. Brucellosis in man manifests the same symptoms whether it be caused by *Br. abortus*, *suis*, or *melitensis*. Some cases are relatively mild and recovery occurs within a few weeks without the disease being identified. Often, however, the disease is protracted for months and sometimes for years.

The typical symptoms, as reported by the U. S. Public Health Service, are fever, headache, aching joints; chills, profuse night sweats with increasing weakness and depression, and loss of weight. At the beginning it may be confused with the grippe. Regional body pains may develop, shifting from one area to another. All symptoms may disappear for a period and then return; hence the name "undulant fever," as the disease is sometimes called. The presence of the undulant type of the disease is an indication that localization of the germ has occurred and that the disease has become chronic. Weakness, tiredness, and inability to carry on any continued effort, with a low grade fever that tends to rise toward late afternoon or evening, are invariably associated with chronic brucellosis. Another symptom associated with chronic brucellosis in man is a nervous condition manifested by depression, melancholia, and irritability, termed variously hypochondria, neurasthenia, or psychoneurosis.

Diagnosis of the disease is positive only by recovery by laboratory methods of the *Brucella* organism from the blood stream or affected

tissues, but even in typical cases the organism is difficult to demonstrate. The blood test, skin test, and opsonic test (the last based on the ability of the patient's white blood cells to ingest *Brucella* organisms in a laboratory test) are other diagnostic methods used but unfortunately none of these are constant owing to variable conditions.

Treatment of brucellosis in man comes under the domain of human medicine. Medical practitioners have been alerted in late years to *Brucella* infection. Anyone in contact with farm animals who develops symptoms as aforementioned should consult his physician immediately.

